

areas of low pressure, one from the southwest and the other from the west, were attended by fog. During the 9th a low barometer area passed eastward off the southern edge of the Banks, but no fog reports have been received for that date. During the 10th, 11th, and 12th the barometer was high and no fog appeared. On the 13th an area of low pressure passed eastward from the Gulf of Saint Lawrence, and dense fog prevailed over the Banks. From the 15th to the 22d, inclusive, fog prevailed, attending the approach of depressions which advanced northeastward along the coast and passed over Newfoundland. From the 23d to the 28th, inclusive, north to west winds prevailed over the Banks, and no fog was reported. During the 29th and 30th an area of low pressure, central over the Gulf of Saint Lawrence, occasioned south to east winds and fog over the Banks. On the 31st a shift of wind to west and northwest caused a disappearance of fog.

Fog was reported off the south coast of Nova Scotia during the 13th and 14th, with west to northwest winds and rising barometer, following the passage of an area of low pressure eastward over the Gulf of Saint Lawrence and Newfoundland on the 13th.

During the 11th and 12th a fog of unusual density extended along the coast from Cape Henlopen to Boston. During this period an area of low pressure moved northeastward along the coast from Hatteras and united off the New England coast with a low barometer area which had advanced eastward from south of Lake Erie. This fog is reported as having caused a complete suspension of navigation along the middle Atlantic coast, and on the rivers from one to two degrees inland; and its great density over so extended an area may be attributed to the abnormally large inflow into the region it covered of warm vapor-laden air from the ocean, and colder, dry air

from the continent, attending the cyclonic circulation of winds around the low barometer areas referred to.

The following are the limits of fog-areas on the north Atlantic Ocean during December, 1887, as reported by shipmasters:

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
·	S. S. La Bretagne .....	°	°	.....	°	°	.....
5-6	S. S. Rugia .....	47 40	45 30	1 a.m.	47 25	46 30	3 a.m.
6	S. S. Erin .....	46 50	43 18	.....	44 32	51 00	.....
6	Fog at Saint John's, N. F.	45 58	46 00	.....	45 48	46 40	.....
6-7	S. S. Minnesota .....	46 31	46 43	Noon .....	45 16	52 04	11 a.m.
7	S. S. Erin .....	44 54	51 00	.....	44 50	51 20	.....
7	Fog at Saint John's, N. F.	40 15	73 50	.....	Sandy Hook.	.....	.....
11-12	S. S. Caracas .....	40 53	69 25	6 a.m.	Boston	.....	8 a.m.
11-12	S. S. Haytian Republic .....	39 48	73 55	.....	Cape Henlopen	.....	.....
11-12	S. S. British King .....	44 13	56 42	9-10 a.m.	44 28	55 46	0-40 p.m.
13-14	S. S. Cynthia .....	44 05	60 02	8 a.m.	Halifax	.....	.....
13	S. S. Peruvian .....	4	.....	4 a.m.	St. John's, N. F.	.....	Midnight.
16	Fog at Saint John's, N. F.	44 41	51 31	Noon .....	44 27	52 33	4 p.m.
17	S. S. Bohemia .....	45 10	49 50	.....	45 08	50 07	.....
17	S. S. Jan Breydel .....	44 49	51 54	.....	44 42	52 20	.....
18	S. S. Beigenland .....	47 00	48 20	8 a.m.	45 30	54 00	8 p.m.
18	Fog at Saint John's, N. F.	46 29	43 59	8 a.m.	45 16	48 05	Midnight.
19	do .....	44 41	51 31	.....	.....	.....	.....
19	S. S. Beigenland .....	44 41	51 31	Noon .....	44 27	52 33	4 p.m.
20-21	Fog at Saint John's, N. F.	47 22	45 34	.....	45 52	49 38	.....
20-21	S. S. Marengo .....	46 40	44 12	.....	45 03	50 23	.....
20-21	S. S. Buffalo .....	47 16	46 55	.....	45 30	48 40	.....
20-21	S. S. Island .....	47 32	44 54	.....	46 53	47 05	.....
21	Fog at Saint John's, N. F.	47 32	44 54	.....	46 53	47 05	.....
29-30	Fog at Saint John's N. F.	42 00	50 00	8 a.m.	45 55	55 42	Noon.
30	S. S. Nova Scotian .....	42 00	50 00	.....	42 00	51 00	.....
30	Fog at Saint John's, N. F.	42 00	50 00	.....	42 00	51 00	.....

\*One hundred and fifty miles east of Saint John's, N. F.

†Saint John's, N. F.

### TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for December, 1887, is exhibited on chart ii by dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal, and subtracting when above.

In the Lake region, Ohio Valley, southern New England, the middle Atlantic states, southern Florida, and on the Pacific coast north of the fortieth parallel, the month was slightly warmer than the average, but in all other districts it was colder. The deficiencies in the monthly mean temperatures exceed 2° over the greater part of the territory to the west of the Mississippi River, and over an extended area reaching from the mouth of the Rio Grande River northwestward to Arizona and Nevada the mean temperatures range from 4° to 8° below the normal. The excess of temperature was greatest in the upper lake region, where it amounted to from 2° to 4°.

The following are some of the most marked departures from normal temperatures at Signal Service stations:

Above normal.	Below normal.
Alpena, Mich .....	4.1
Escanaba, Mich .....	3.8
Mackinaw City, Mich .....	3.6
Port Huron, Mich .....	2.7
Pittsburg, Pa .....	2.3
Washington City .....	2.2
New York City .....	2.1
Key West, Fla .....	2.0
Prescott, Ariz .....	8.3
Winnemucca, Nev .....	7.0
Fort Grant, Ariz .....	6.6
Corpus Christi, Tex .....	6.4
Fort Davis, Tex .....	6.0
Rio Grande City, Tex .....	5.8
Abilene, Tex .....	5.7
Santa Fé, N. Mex .....	5.2

### RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of tem-

perature at Signal Service stations are given in the table of miscellaneous meteorological data. As usual the ranges were greatest over the region between the Mississippi and the Rocky Mountains, where they generally vary from 60° to 80°; the least monthly ranges occur on the Pacific coast, and are 30° or below at most stations.

The following are some of the extremes:

Greatest.	Least.
Saint Vincent, Minn .....	87.2
Fort Assinaboin, Mont .....	81.8
Denver, Colo .....	80.2
Fort Custer, Mont .....	77.9
Fort Totten, Dak .....	76.2
Fort Stanton, N. Mex .....	75.3
Willcox, Ariz .....	75.3
North Platte, Nebr .....	74.2
Tatoosh Island, Wash .....	16.6
Key West, Fla .....	17.8
Fort Canby, Wash .....	18.3
Port Angeles, Wash .....	22.6
Olympia, Wash .....	25.5
Portland, Oregon .....	28.3
San Francisco, Cal .....	28.9
Linkville, Oregon .....	34.2

The greatest daily ranges of temperature amounted to, or exceeded, 53° at Yankton, Dak., on the 23d, Willcox, Ariz., 9th, and Fort Supply, Ind. T., 17th. The lowest daily ranges were 2°, or below, at Green Bay, Wis., on the 9th, Linkville, Oregon, 8th, and Astoria, Oregon, 22d.

### FROST.

In all districts except the Southern States frosts were of daily occurrence. In the east Gulf states they were reported on the 6th, 11th, 13th, 18th, 19th, 21st, 22d, 24th to 26th, and 28th to 30th; in the west Gulf states, 5th, 6th, 9th, 12th to 14th, 16th to 31st; Florida, 19th, 29th, 30th; lower Rio Grande valley, 18th, 21st to 25th; northern California, 3d, 7th, 10th, 11th, and from 13th to 31st; southern California, 2d, 5th, 8th to 10th, 12th, 15th, 17th to 20th, 22d to 26th, 28th, 31st.

### DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperatures for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has

been computed; (3) the mean temperature for December, 1887; (4) the departures of the current month from the normal; (5) and the extreme monthly means for December during the period of observations and the year of occurrence:

perature; the average depth at which the observations were made, and the mean temperature of the air:

State and Station.	County.	(1) Normal for the month of Dec.	(2) Length of record.	(3) Mean for December, 1887.	(4) Departure from normal.	(5) Extreme monthly mean temperature for December.			
						Highest.		Lowest.	
						Am't.	Year.	Am't.	Year.
<i>Arkansas.</i>									
Lead Hill.....	Boone.....	°	Years	°	°	°	1881	°	1884
<i>California.</i>									
Fall Brook.....	San Diego.....	52.3	11	49.8	-2.5	55.0	1883	49.8	1887
Sacramento.....	Sacramento.....	46.1	22	42.6	-3.5	50.9	1880	39.5	1874
<i>Connecticut.</i>									
Middletown.....	Middlesex.....	28.3	29	30.0	+1.7	.....	.....	.....	.....
New Haven.....	New Haven.....	30.7	101	32.6	+1.9	.....	.....	.....	.....
Thompson.....	Windham.....	27.7	30	28.3	+0.6	.....	.....	.....	.....
Waterbury.....	New Haven.....	29.2	12	29.0	-0.2	.....	.....	.....	.....
<i>Illinois.</i>									
Aurora.....	Kane.....	24.6	8	24.6	0.0	.....	.....	.....	.....
Collinsville.....	Madison.....	31.8	8	29.8	-2.0	.....	.....	.....	.....
Golconda.....	Pope.....	34.0	9	35.7	+1.7	.....	.....	.....	.....
Greenville.....	Bond.....	30.2	10	29.6	-0.6	.....	.....	.....	.....
Mattoon.....	Coles.....	29.7	7	30.0	+0.3	.....	.....	.....	.....
Peoria.....	Peoria.....	26.6	32	29.9	+1.3	.....	.....	.....	.....
Rockford.....	Winnebago.....	23.9	15	23.6	-0.3	.....	.....	.....	.....
Riley.....	McHenry.....	21.6	26	22.2	+0.6	.....	.....	.....	.....
<i>Indiana.</i>									
Logansport.....	Cass.....	29.0	33	31.0	+2.0	45.0	1877	14.0	1872
Spiceland.....	Henry.....	29.2	34	30.4	+1.2	.....	.....	.....	.....
Vevay.....	Switzerland.....	34.6	21	35.5	+0.9	.....	.....	.....	.....
<i>Iowa.</i>									
Oresco.....	Howard.....	16.2	15	18.0	+1.8	.....	.....	.....	.....
<i>Kansas.</i>									
Independence.....	Montgomery.....	33.5	16	30.3	-3.2	47.2	1887	25.4	1884
Lawrence.....	Douglas.....	29.3	20	28.1	-1.2	44.4	1877	19.8	1872
Wellington.....	Sumner.....	32.8	9	31.8	+1.0	38.6	1881	25.6	1880
Yates Centre.....	Woodson.....	26.7	8	28.2	-0.5	37.2	1881	22.8	1884
<i>Maine.</i>									
Belfast.....	Waldo.....	23.4	28	25.4	+2.0	.....	.....	.....	.....
Cornish.....	York.....	22.5	30	24.3	+1.8	27.5	1877	14.2	1857
Gardiner.....	Kennebec.....	23.0	51	25.5	+2.5	.....	.....	.....	.....
Orono.....	Penobscot.....	20.9	19	23.7	+2.8	.....	.....	.....	.....
<i>Maryland.</i>									
Cumberland.....	Alleghany.....	33.3	16	32.9	-0.4	38.5	1881	26.0	1880
Fallston.....	Harford.....	33.0	17	33.4	+0.4	40.2	1877	23.6	1876
McDonogh.....	Baltimore.....	33.0	10	33.9	+0.9	39.7	1881	26.0	1880
<i>Massachusetts.</i>									
Amherst.....	Hampshire.....	26.7	50	29.7	+3.0	.....	.....	.....	.....
Cambridge.....	Middlesex.....	29.1	65	31.0	+1.9	.....	.....	.....	.....
Fitchburg.....	Worcester.....	25.8	31	27.2	+1.4	.....	.....	.....	.....
New Bedford.....	Bristol.....	31.9	76	32.2	+0.3	.....	.....	.....	.....
Springfield.....	Hampden.....	27.7	21	29.6	+1.9	.....	.....	.....	.....
Taunton.....	Bristol.....	30.5	16	31.9	+1.4	.....	.....	.....	.....
<i>Nevada.</i>									
Carson City.....	Ormsby.....	35.8	8	31.2	-4.6	.....	.....	.....	.....
<i>New Brunswick.</i>									
Saint Johns.....	Saint Johns.....	22.6	27	23.1	+0.5	.....	.....	.....	.....
<i>New Hampshire.</i>									
Concord.....	Merrimac.....	26.0	20	29.5	+3.5	.....	.....	.....	.....
Hanover.....	Grafton.....	20.8	26	22.4	+1.6	.....	.....	.....	.....
<i>New Jersey.</i>									
Dover.....	Morris.....	29.8	5	30.4	+0.6	.....	.....	.....	.....
<i>New York.</i>									
Factoryville.....	Tioga.....	27.6	6	29.6	+2.0	29.6	1887	22.3	1886
Humphrey.....	Cattaraugus.....	24.1	4	27.6	+3.5	27.6	1887	20.1	1886
North Volney.....	Owego.....	25.6	20	27.2	+1.6	33.7	1881	18.0	1876
Palermo.....	Oswego.....	24.6	34	25.4	+0.8	31.9	1857	17.6	1872
<i>Ohio.</i>									
Wauseon.....	Fulton.....	26.3	17	26.9	+0.6	38.8	1877	17.1	1872
Yellow Springs.....	Greene.....	30.1	3	30.9	+0.8	33.3	1885	26.1	1886
<i>Pennsylvania.</i>									
Corry.....	Erie.....	26.5	8	27.9	+1.4	35.2	1881	20.2	1886
Duberry.....	Wayne.....	25.0	23	26.1	+1.1	.....	.....	.....	.....
<i>Rhode Island.</i>									
Providence.....	Providence.....	30.0	56	32.5	+2.5	.....	.....	.....	.....
<i>South Carolina.</i>									
Stateburg.....	Sumter.....	46.9	7	45.3	-1.6	51.3	1883	43.6	1882
<i>Tennessee.</i>									
Milan.....	Gibson.....	38.0	5	38.4	+0.4	.....	.....	.....	.....
<i>Texas.</i>									
New Ulm.....	Austin.....	53.6	15	48.8	-4.8	60.9	1875	46.1	1876
<i>Vermont.</i>									
Lunenburg.....	Essex.....	19.4	38	22.1	+2.7	.....	.....	.....	.....
Stratford.....	Orange.....	21.3	13	22.2	+0.9	29.5	1881	13.5	1876
<i>Virginia.</i>									
Bird's Nest.....	Northampton.....	41.6	19	41.2	-0.4	.....	.....	.....	.....
Dale Enterprise.....	Rockingham.....	38.6	7	36.2	-2.4	51.4	1880	28.4	1882
Variety Mills.....	Nelson.....	36.4	11	34.9	-1.5	43.3	1879	30.6	1876
Wytheville.....	Wythe.....	34.8	23	35.3	+0.5	42.0	1879	26.0	1876
<i>West Virginia.</i>									
Helvetica.....	Randolph....	33.2	11	35.1	+1.9	42.5	1879	24.6	1880

## TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature, for December, 1887, as observed at the harbors of the several stations; the monthly range of water tem-

Station.	Temperature at bottom.				Mean temperature of air at the station.	Average depth of water in feet and tenths.
	Max.	Min.	Range.	Monthly mean.		
Canby, Fort, Wash.	47.9	40.6	7.3	44.6	43.6	17.9
Cedar Keys, Fla.	67.3	50.2	17.1	59.5	57.5	7.4
Charleston, S. C.	54.9	48.2	6.7	52.3	51.1	36.9
Eastport, Me.	45.0	39.0	6.0	42.4	25.5	16.3
Galveston, Tex.	64.7	40.3	24.4	53.7	15.2	53.3
Key West, Fla.	75.8	70.8	5.0	73.5	19.7	72.0
New London, Conn.	46.5	40.5	6.0	43.3	35.0	12.2
New York City	43.2	35.1	8.1	40.2	36.1	14.7
Pensacola, Fla.	59.7	45.7	13.0	52.3	53.5	17.9
Portland, Me.	40.9	36.4	4.5	39.6	27.9	16.4
Portland, Oregon	46.0	39.0	7.0	41.8	42.6	54.2
† 26 days. * 15 days.						
<i>Table of comparative maximum and minimum temperatures for December.</i>						
State or Territory.	Stations.	For 1887.		Since establishment of station.		
		Max.	Min.	Max.	Year.	Length of record.
Alabama	Mobile	69.3	25.4	78.8	1884	14.0
Do.	Montgomery	67.8	22.0	77.1	1884	8.0
Arizona	Prescott	57.0	7.5	70.0	1881	— 18.0
Do.	Fort Apache	57.2	1.1	70.0	1882	— 8.0
Arkansas	Fort Smith	71.5	8.0	78.1	1883	7.7
Do.	Little Rock	65.0	13.5	78.0	1880, 1884	6.0
California	San Francisco	69.3	40.4	68.0	1878	34.0
Do.	San Diego	74.5	35.5	82.0	1874	32.0
Colorado	Denver	66.6	13.6	74.1	1885	2.5
Do.	Montrose	47.6	16.2	55.5	1875	— 10.1
Connecticut	New Haven	55.5	7.5	62.0	1875	9.5
Do.	New London	57.3	8.8	60.5	1879	7.5
Dakota	Fort Buford	44.8	— 25.0	59.3	1885	47.0
Do.	Yankton	45.2	— 16.4	62.0	1875	35.0
Dis. of Columbia	Washington City	59.0	14.2	73.0	1873	— 11.5
Florida	Jacksonville	76.3	31.0	81.0	1875	19.0
Do.	Key West	80.5	62.7	88.0	1876	44.0
Georgia	Atlanta	64.9	15.3	71.0	1879	1.0
Do.	Savannah	70.6	28.0	80.0	1875	16.0
Idaho	Boise City	53.1	10.2	60.5	1885	7.3
Illinois	Cairo	58.2	5.0	72.0	1875	7.0
Do.	Chicago	53.4	— 4.8	68.0	1875	23.0
Indiana	Indianapolis	57.0	— 3.0	68.0	1875	— 10.0
Indian Ter.	Fort Sill	68.0	7.6	77.0	1880	2.0
Iowa	Dubuque	49.6	— 15.5	64.0	1878	23.5
Do.	Des Moines	50.4	— 12.6	57.0	1883	19.5
Kansas	Dodge City	66.3	9.0	71.0	1875	13.5
Do.	Leavenworth	62.2	9.8	72.0	1875	14.0
Kentucky	Louisville	60.2	4.0	74.0	1875	4.0
Louisiana	New Orleans	77.0	29.4	78.0	1875, 1879	20.0
Do.	Shreveport	74.0	20.0	79.0	1875	10.0
Maine	Eastport	49.6	— 10.0	54.0	1877	— 21.0
Do.	Portland	54.8	— 1.8	59.0	1884	12.0
Maryland	Baltimore	58.6	15.9	71.0	1881	2.0
Massachusetts	Boston	59.1	4.9	66.0	1872	18.0
Michigan	Marquette	42.4	3.9	59.0	1875	20.0
Do.	Grand Haven	52.9	4.7	61.0	1877	— 12.0
Minnesota	Saint Vincent	43.1	— 44.1	44.8	1884	47.8
Do.	Saint Paul	41.1	— 22.4	56.0	1877	39.0
Mississippi	Vicksburg	73.0	21.5	79.0	1873, 1875	10.5
Missouri	Saint Louis	58.0	— 2.0	74.0	1875	17.0
Montana	Ft. Assinaboine	52.0	— 29.8	67.9	1885	50.0
Do.	Helena	54.5	— 13.2	56.8	1885	40.0
Nebraska	North Platte	56.0	— 18.2	69.0	1885	— 25.0
Do.	Omaha	48.0	— 14.5	66.0	1875	— 17.0
Nevada	Winnemucca	48.0	— 1.3	65.0	1878	— 20.0
New Jersey	Atlantic City	56.0	14.5	64.0	1877	— 6.0
New Mexico	Santa Fe	45.0	— 8.0	65.0	1878	— 13.0
New York	Buffalo	53.0	6.1	62.0	1875	— 9.0
Do.	New York City	56.4	11.6	66.2	1881	— 2.0
North Carolina	Charlotte	62.8	16.3	71.0	1884	— 2.0
Do.	Wilmington	67.0	19.0	78.0	1879	11.0
Ohio	Cincinnati	58.8	1.3	72.0	1875	— 8.0
Do.	Sandusky	57.9	1.0	63.0	1879	— 13.0
Oregon	Portland	57.0	28.7	65.4	1886	4.0
Do.	Roseburg	58.0	26.3	65.6	1886	7.0
Pennsylvania	Pittsburg	61.5	7.5	74.8	1885	— 9.0
Do.	Philadelphia	58.9	14.5	70.0	1873	— 5.0
Rhode Island	Block Island	58.0	12.6	60.0	1884	— 3.2
South Carolina	Charleston	73.4	29.1	76.0	1881	14.5
Tennessee	Knoxville	64.0	13.6	75.0	1874	— 2.0
Do.	Memphis	62.0	14.5	74.0	1875	3.0
Texas	Brownsville	79.1	26.2	92.9	1885	18.0
Do.	Fort Elliott	61.9	— 3.5	83.0	1880	— 10.0
Utah	Salt Lake City	49.7	8.7	61.0	1874	— 8.0
Virginia	Lynchburg	62.4	12.9	73.0	1873	— 4.0
Do.	Norfolk	63.7	18.8	73.0	†	6.0
Washington	Spokane Falls	53.1	15.2	57.2	1886	— 17.8
Do.	Olympia	55.5	30.0	64.2	1885	8.0
Wisconsin	La Crosse	42.5	— 21.4	60.0	1877	— 28.0
Do.	Milwaukee	52.7	— 6.0	63.0	1877	— 21.6
Wyoming	Cheyenne	56.0	— 12.8	64.2	1885	— 23.0

† 1873, 1874, 1875, 1879.